2.4. THEORETICAL ASPECTS OF THE INNOVATION ECOSYSTEM

Abstract. Creating favorable conditions for sustainable innovation in the economy is linked to the formation of an ecosystem. In the work, the author discusses the essence of an innovative ecosystem, elements of the innovation ecosystem and their interconnection at different stages of the innovation life cycle are separated. The article explains the place of the linear model of the innovation process in the concept of national innovation system, the ecosystem development levels and their characterization are also given.

Key words: Innovation, Innovative Ecosystem, Innovative Activities, Fundamental Studies, Commercialization, Global Economy, Innovators, Investors, National Innovation System.

Introduction

Under the modern conditions, preferable lines of economic development of the country is preferable development of innovative high-technology lines. Market conditions of forming innovation economy is characterized with the global changes, global transformation of innovation activities, large scales of changes, which make the task of forming innovation ecosystem actual. It is capable to provide competitiveness of industrial production in the field of high technologies, national safety and sustainable social and economic development throughout the economy of the country.

Theoretical aspects of innovation ecosystem, analysis of market elements of innovation ecosystem and their basic elements and their interaction, study of consistent pattern and principles of ecosystem functioning, and necessity for the issues of determining stages for gorming innovation ecosystems gives rise to the actuality of the above work, moreover, study of the named issues at the scientific level became one of the main challenges for the leaders of development of the country economy, scientists, professors of the higher schools and including me (1, 2, 3, 4, 5, 6, 7).

Generally, the interest in the problem of establishing innovation ecosystem and development of the theory and practice of innovation and national innovation system is being rapidly increased. It

is confirmed by the abundance of the scientific publications dedicated to the topic: Golichenko O. (3); Coralio A., Passiante G., Prertcipe A. (17); Etzkowitz H. (18); Lundvall B. (20); Metcalfe S. (21); Moore J. (22); Nelson R. (23); Leydesdorff L. (19); Reshetnikova M. (12); Smorodinskaya M. (12); Smorodinskaya N. (13); Tretiakov V. (14); Yakovleva A. (16) etc.

Review of the foreign and native literature studied by us shows that according to the opinion of most of the scientists and practitioners, the way of innovation development, and formation and effective functioning of the innovation ecosystem is the main factor for getting out of the technology deadlock by the national economy and achieving sustainable development of the economy.

Study of the innovation ecosystem mechanism, as well as structural peculiarities, types and important elements of the ecosystem, and the analysis of the market conditions for creating other key parameters and local innovation ecosystem, will support improvement of the innovation activities of the country.

Theoretical Aspects forCreating Innovation Ecosystem

1. For the concept of innovation ecosystem

Creating conditions for the sustainable innovation development of the economy during recent period is related with the formation of the innovation ecosystem. It characterizes the modern model of modern innovation development of the region and the country and it is of the earlier concepts, including the main and primary concept – actual version of the theory of the national innovation system.

The concept of creating innovation ecosystem has been offered by Charles V. Wesner in 2004 [25] and it represents the instrument for creating terms for raising competitiveness of an organization in the national and regional economies. Central issue of the concept is opinion about the innovation, as well as the process of transformation of scientific studies into the market products; i.e. innovation is the activity, service requiring diversified collective efforts from its participants (companies, universities, scientific-research companies, venture and similar funds). Innovation ecosystem forms such efforts and supports obtaining of synergy effect.

It shall be noted that the term Ecosystem, comprising of the natural science, was used much earlier in regards with the economic and public phenomenon. For example, in 1996 J. O. Moore formulated the idea of business ecosystem [22], which is comprised of the companies and the network of the suppliers, market intermediates, consumers and competitors formed by them. The author states that relations between the companies are built like the ecosystem in the nature, and by means of interaction (even if the companies are not partners, but competitors) much better result may be achieved, compared to the results of independent functioning.

Ideas of J. F. Moore assisted distribution of the concept of ecosystem to the narrower fields of the industrial domain. For example, to describe digital business ecosystem [17], which essentially is the component of the industrial ecosystem. Under the modern conditions, they often speak about establishment of the large international companies and transnational companies, which are mostly specialized in the manufacturing of computers and software, ecosystem of their products, filling each other harmonically and creating benefit to the users from their joint use. In terms of the company creating ecosystem, the product is increasing attractiveness of products in the eyes of the user, as well as new opportunities of the economy (to use joint advertisement concept, products are intended for joint use and relatively unified target auditory). Increased loyalty and additional preventive factors to the brand, which are originated from the transferring to the competitive products

Example: Ecosystem of Apple device is a good example: joint contacts may be performed by simultaneous use of iPhone, iPod, IPad and Mac computers, photos may be synchronized, interdevise services through iCloud (closed service), similar applications and music tracks may be uploaded on them, purchased online single times. Users may also apply for the service relations (iMessage and FaceTime), provided that the dialogue partner also use Apple device. For IOS8 and operative system OS X Yosemite notebooks, by using Continuity functions users may start working on one devise and instantly continue the work on another devise.

Microsoft tries to create the system of similar devises and software products for the users, which launched tablets of Surface for Windows 8 and developed mobile version of its operative system (used in the group of smartphones Nokia Lumia).

According to G.G. Vinberg's explanations, ecosystem (from Greek – residence, location) is the natural complex created with the live organisms, residential environment (soil, water reservoir etc.), connected to each other by the exchange of substances and energy [24].

Ecosystem of innovations is the environment created directly by the participants of innovation process. Their interaction takes place, which is directed towards creation and development of innovations.

In the collection of articles "Venture Investments and the Ecosystem of Technology Entrepreneurship" gives following determination of the innovation ecosystem: "this is the complex and interrelated system of the organisms having different shapes, state institutions, legislative and other stimuli, social relationships, services and practices, which is comprised of the relatively successful process of transformation of the innovative engineer-technical ideas into the successful high-technological companies" [9]. Hence, it is specified that "commercialization of knowledge is the most successfully implemented under the favorable and supported environment, called the ecosystem of venture investment" [10].

Innovation ecosystem may be determined as the union (or network union), playing the role of capitalizer for the transformation, exchanging, spreading and effective distribution of knowledge and other resources of interaction of the participants [11]. From this point of view, one of the main objectives of the innovation ecosystem, as the union is organization of cooperation of the process participants, when the agents, having no required resources separately, achieve their common goals through the complimenting of the later. Thus, the term Innovation Ecosystem synthesizes two key concepts – Innovation and Ecosystem.

Ecosystem is the complex (according to the definitions of the researcher of complex systems L. Bertalanff), self-organized, self-

regulated and self-developing system. Ecosystem is the open system, characterized with the subject and energy input and output streams. According to the definitions of G.G. Winberg, Ecosystem (from Greek Oikos – residence, location) is the natural complex created by the live organisms and the environment of their residence (soil, water reservoir etc.), interrelated through the exchange of substances and energy [24].

And finally, in view of the aforesaid, main features of the innovation ecosystem may be formulated as follows:

- ✓ High quality of self-organization (ability of maintaining "order" spontaneously, locally, in course of interaction, i.e. without any leader);
- ✓ The rule of decentralization for taking decision;
- ✓ Cooperation and mutual assistance of the participants, independent of their status and opportunities;
- ✓ Coevolution (mutual development of the subjects, in course of interaction);
- ✓ Adaptability (adaptation with the variable environment through internal changes);
- ✓ Reliability (totality of the system, i.e. existence of the features, which are not characterized to its separate elements)

We consider it purposeful to determine the place of lineal model of the innovative process in the concept of the national innovation system.

Ch. Wesner sees linear nature of the traditional model of the innovation system in the fact that innovation activity is represented in it as unidirectional process. It seems that increasing state and private investments in the scientific surveys will automatically increase success of the country in the commercialization of the technologies and, respectively, at the global market of national competitiveness (Figure 2.4.1).

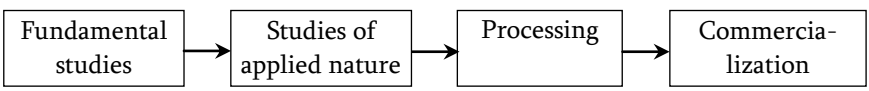

Figure 2.4.1 – Linear model of innovation process in the concept of the national innovation system [25]

In fact, it is impossible to distinguish scientific-research works of fundamental nature from the surveys of applied nature. These processes are closely related and there is the probability of spontanic existence of the new field of application at the processing stage. Moreover, many inventions are accompanied by the mistakes and the process of inspection, making the process nonlinear and foresees existence of feedback at each stage. At the expense of this feedback internal development of each range, as well as total development of the entire system takes place (Figure 2.4.2).

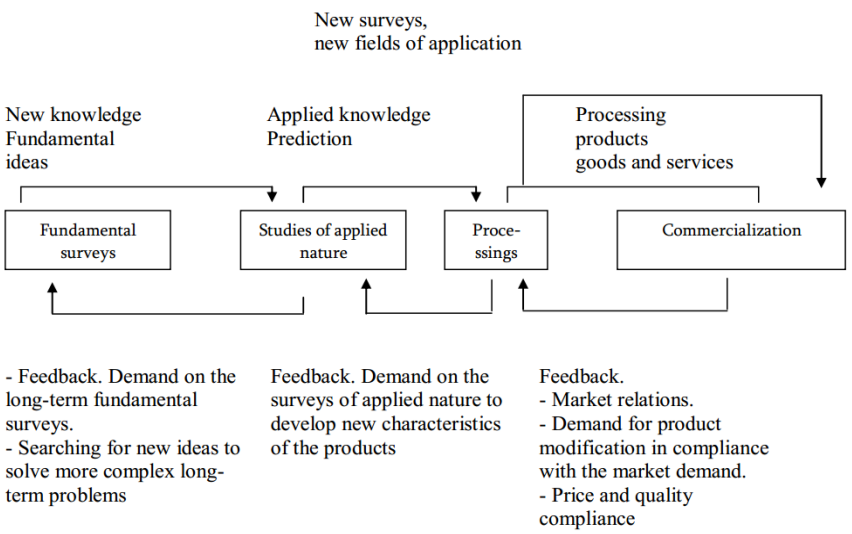

Figure 2.4.2 – Non-linear model of innovation process, in the concept of innovative ecosystem

The concept of Innovation Ecosystem considers self-organized, self-regulated and self-developed open system, which is characterized with the input flows of the ideas, values, humans, information and resources. According to this opinion, innovation ecosystem is the economy, in which the subjects specific to the economic and social relations operate. Specificity of innovation ecosystem exists in the fact that it products innovations, ideas, intellectual property and human resources for the society and other fields, as well as resources for self-development.

Innovation ecosystem cannot exist without global economy, as it gives rise to the demand for innovations and changes, and global economy without innovation ecosystem is doomed to stagnation and degradation, as innovation ecosystem accumulates main creative resources. Grounds to the innovation ecosystem are innovators or innovation individuals – i.e. the persons creating, developing and advancing innovations based on the own motivation or/and demand. Except innovators, innovation ecosystem is comprised of the different agents, supporting innovators. These are the investors, corporations and foundations, funding innovations. There are two determining directions supporting innovation ecosystems – flow of innovations and the flow of demand on the innovations. Correspondingly, all participants of the innovation ecosystem may be conditionally divided into two categories – those creating demand on the innovations and those creating innovations themselves.

2. The levels of development of innovation ecosystem and their characterizing

Innovation ecosystems shall be formed after the innovation development according to the levels (Figure 2.4.3): global (supranational), national, regional, corporate and individual.

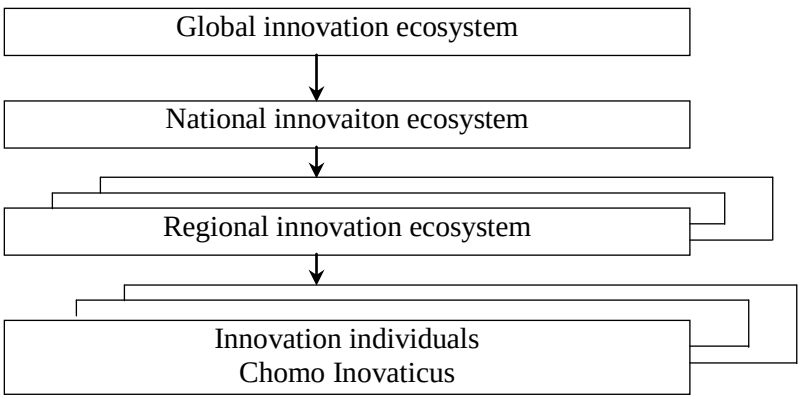

Figure 2.4.3 – Structural scheme of the global economic ecosystem, in terms of open innovation

Global innovation ecosystem. Main objective of the global innovation ecosystem is creation of the environment and conditions for implementation of the global innovation projects for implementation of breakthroughs in the recognized fields of knowledge (digital world, energy, biotechnologies, nanotechnologies etc.), as well as the development and support of the balance between the global system of patenting and openness of new technologies maintenance of rights on the intellectual property.

National innovation ecosystem is comprised of the different institutions, organizing innovation processes of fundamental studies and processing, pre-initial and initial venture investments. All these formulate innovation mentality of the public, as well as innovation entrepreneurship, creating conditions for the generation of new ideas, for their further commercialization. In this regards attraction of the creative, competent people and understanding of the national strategy preferences is of the great importance, as well as their application to form strategic innovation objectives, in the global competitive racing.

Regional (territorial) innovation ecosystem is the relatively developed element of the national innovation ecosystem, as the territory is simultaneously the user and customer of the innovations, innovation products, and innovation service. It is oriented towards creation of the comfort conditions for achievement of competitiveness of the territory, in the issue of solving the issue of innovative development of Mezodon, reflected in the competitiveness of the human capital.

Basic examples of the self-sufficient territorial ecosystems (well-known innovative ecosystems): "Silicone Valley", MIT (Boston), Cambridge, Harvard etc. As a rule, grounds of the territorial innovative ecosystem are: universities and research institutions, being able to be the source for ideas, innovations, generators of new processing and innovative capital: small innovation entities, corporations and companies, manufacturing innovative products, the system of development of venture investments, innovation society (team), which are traditionally oriented towards the innovation processes.

Corporate innovation ecosystem is developed at the platform of the private-public partnership of the theory of open innovations, considering distribution of the state assistance and the risks of the innovation projects.

Hence, it foresees organization of innovation activities inside the corporation and creation of the small network of innovation enterprises. Open innovations foresee continuous and permanent searching for the new competences for innovation projects, implementation of which best possible inside the corporation, through partners, cooperation with universities, and attracting innovation companies (startups) for the realization of innovation projects. Herewith, preliminary establishment of holding and the terms of application of intellectual property shall be foreseen.

As a rule, organization of the scientific-research activities of a corporation is provided through the spinoff of the head companies. These companies participate in the educational processes of universities and represent improvement of technologies based on the received knowledge.

Individual level of innovation ecosystem represents innovative human (Homo Innovaticus) – innovation development subject, who generates and realizes innovation ideas and who shall permanently upgrade his/her knowledge, self-education, be mobile, geographic and mental, hold research and design competences, have the ability of partnership relations and trust-based cooperation.

To form individual level of innovation ecosystem we consider reforming of the education system needed, which will be based on the consideration of deep changes in the terms of modern globalization, long-life education strategy, creation of the comfort terms and conditions for labor and life quality for the persons, providing innovation processes. These are researchers, analysts, experts, investors, business-angels, venture funding and innovation entrepreneurship managers, startup founders etc.

The role of universities shall be strengthened in the innovation and scientific, knowledge-based society through the interaction of state and business. The problems of forming individual ecosystem is the subject of discussions, at the innovation forums, where key competences of innovation community were formed.

Basic of these competences are the following: “permanent improvement skill”; “striving to innovation”, “critical thinking”, “smart risk skill”, “creativity and reliability”, “team working skill”, “skill of working independently in the high-competitive environment” etc.

Named signs of the individual innovation ecosystem (Homo Innovaticus), as stated above, was presented and described by I. Shumpeter (15), when characterizing subjects of innovation activities – innovation entrepreneurs. Modern development of innovation process is directed not only to the satisfaction of requirements, but also mostly to formation of the requirements, satisfied by the development of the forward-looking technologies (foresight, road maps). Here a human innovatively performs creation of the future sample, which is highly developed and competent not only in the science, but also economy, policy etc.

Formation of innovation ecosystem is one of the main challenges to the country economy under the modern conditions, which is at the same time is the social-economic innovation of the state system. Due to the this, analysis of the elements of the innovation ecosystem make it possible to identify functions and objectives of all its levels.

3. Conclusion

Development of innovation process to the modern self-regulated forms of the linear models of innovation activities gave rise to the complex and multi-aspect concept – formation of the innovation ecosystem. To our mind, innovation ecosystem considers self-organized, self-regulated and self-developing open system. It is characterized with the flows of ideas, values, humans, information, and resources. In these regards, innovation ecosystem is the economy, in which special subjects of economic and social relations operate. Consideration of the innovation ecosystem is accepted to be performed according to the following widely recognized levels: global innovation ecosystem, national innovation ecosystem, regional innovation ecosystem, and innovation individual.

To formulate individual level of innovation ecosystem, we consider it necessary to reform such system of education, which is based on the understanding of deep changes in the modern globalization conditions, continuous strategy of education, and provision of comfort conditions for labor and high quality of living of the persons employed in the field of science and high technologies.

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